CLAIMS

1. A method for producing a magnetorheological fluid comprising the steps of:

exposing ferromagnetic particles to a nitrogen-rich environment for an interval sufficient to impart a nitrogen-rich surface on the ferromagnetic particles; and

integrating the ferromagnetic particles having a nitrogen-rich surface into a magnetorheological carrier fluid.

2. The method of claim 1 wherein the ferromagnetic particles are composed of an iron material exhibiting magnetorheological characteristics.

3. The method of claim 3 wherein the ferromagnetic particles include at least one of carbonyl iron, reduced carbonyl iron, crushed iron, milled iron, melt sprayed iron, low carbon steel, silicon steel, and iron alloys.

4. The method of claim 1 wherein the nitrogen-rich environment comprises a major portion of nitrogen and a minor portion of a gaseous material inert to interaction with the ferromagnetic particles.

5. The method of claim 1 wherein the ferromagnetic particles are composed of a first portion of ferromagnetic particles having a first average size distribution and a second portion of ferromagnetic particles having a second average size distribution, wherein the average size distribution of the first portion of the ferromagnetic particles is greater than the average size distribution of the second portion of the ferromagnetic particles.

6. The method of claim 5 wherein the average size distribution of the first portion of the ferromagnetic particles is between 5 and 30 microns.

7. The method of claim 5 wherein the average size distribution of the second portion of the ferromagnetic particles is between 1 and 10 microns.

8. The method of claim 1 wherein the ferromagnetic particles exposed to the nitrogen-rich environment include particles having an average particle size distribution between 1 and 10 microns.

9. The method of claim 8 further comprising the step of integrating the ferromagnetic particles having an average particle size distribution between about 1 and about 10 microns with larger size ferromagnetic particles, the integration occurring prior to exposure of the small-sized ferromagnetic particles to the nitrogen-rich environment.

10. The method of claim 8 wherein the ferromagnetic particles having an average particle size distribution between 1 and 10 microns are integrated with larger size ferromagnetic particles after exposure to the nitrogen-rich environment.

11. The method of claim 1 wherein the ferromagnetic particles are maintained in a nitrogen-rich environment at a temperature sufficient to initiate nitriding on the surface of the ferromagnetic particles.

12. A method for reducing oxidation of ferromagnetic particles in a magnetorheological fluid comprising the step of:

exposing ferromagnetic particles to a nitrogen-rich environment for an interval sufficient to impart a nitrogen-rich surface on the ferromagnetic particles prior to introduction of the ferromagnetic particles into the magnetorheological fluid.

13. The method of claim 12 wherein the ferromagnetic particles are composed of an iron material which when integrated with a fluid material will yield a magnetorheological fluid exhibiting at least some magnetorheological characteristics

14. The method of claim 13 wherein the ferromagnetic particles include at least one carbonyl iron, reduced carbonyl iron, potato iron, crushed iron, milled iron, melt-sprayed iron, and iron alloys.

15. The method of claim 12 wherein the ferromagnetic particles exposed to the nitrogen-rich environment have an average particle size distribution between about 1 and 10 microns.

16. The method of claim 15 wherein the ferromagnetic particles having an average particle size distribution in a range between 1 and 10 microns are admixed with ferromagnetic particles having an average particle size distribution in a range between about 5 and 30 microns, the admixture occurring after the ferromagnetic particles having an average particle size in a range between 1 and 10 microns have been exposed to the nitrogen-rich environment.

17. The method of claim 15 wherein the ferromagnetic particles having an average particle size distribution between about 1 and about 10 microns are admixed with ferromagnetic particles having an average particle size distribution in a range greater than 10 microns, the admixture occurring after the ferromagnetic particles having an average particle size between about 1 and 10 microns have been exposed to the nitrogen-rich environment.

18. A method for imparting an oxidation resistant surface to magnetic metallic particles having an outwardly oriented surface, the method comprising the steps of:

introducing magnetic particles to a nitrogen-rich environment;

elevating an ambient temperature of the particles and nitrogen-rich environment to a temperature which facilitates uptake of nitrogen and formation of nitrogen-containing compounds proximate to the surface of the magnetic particles; and

maintaining the magnetic metallic particles in the nitrogen-rich environment for an interval sufficient to produce a nitrogen-rich surface coating on the particles.

19 The method of claim 18 wherein the magnetic metallic particles include at least one of carbonyl iron, reduced carbonyl iron, crushed iron, milled iron, melt-sprayed iron, and iron alloys.

20. The method of claim 18 wherein the particles have an average size distribution in a range between 1 and 10 microns.

21. The method of claim 18 wherein the particles are composed of at least two classes of particles, a first class having an average size distribution in a range between 1 and 10 microns, and a second class having an average size distribution between 5 and 30 microns.

22. A magnetorheological fluid comprising:

first ferromagnetic particles having an average particle size in a range between 1 and 10 microns;

second ferromagnetic particles having an average particle size in a range between 5 and 30 microns; and

a carrier fluid, wherein at least one of the first and second ferromagnetic particles have a surface characterized by nitrogen-containing compounds associated therewith.

23. The magnetorheological fluid of claim 22 wherein the first particles are composed of at least one of carbonyl iron, reduced carbonyl iron, crushed iron, potato iron milled iron, melt-sprayed iron, and iron alloys.

24. The magnetorheological fluid of claim 22 wherein the second particles are composed of at least one of carbonyl iron, reduced carbonyl iron, crushed iron, milled iron, melt-sprayed iron, and iron alloys.

25. The magnetorheological fluid of claim 23 wherein the second particles have a surface resistant to oxidation, the surface characterized by nitrogen-containing compounds associated therewith.